

Applicants : Kenneth Schofield, Mark L. Larson and Keith J. Vadas
Serial No. : 10/643,602
Page : 2

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the present application:

1-49. (Canceled).

50. (Currently Amended) A vision system for a vehicle, comprising:

a vehicle equipped with at least two image capture devices, said at least two image capture devices capturing ~~an image~~ images external of the vehicle, said at least two image capture devices having overlapping fields of view;

said vehicle equipped with an image processor, wherein outputs of said at least two image capture devices are processed by said image processor, said image processor producing a synthesized image from said outputs of said at least two image capture devices;

said vehicle equipped with a display screen displaying said synthesized image, said synthesized image displayed as a single image on a single display screen that is viewable by a driver of said vehicle when the driver is normally operating said vehicle, wherein the displayed image displayed on said single display screen includes an image portion from each of said at least two image capture devices; and

said image processor processing said outputs by at least one technique chosen from luminant blending, chrominant blending, dynamic range extending, pixel group compensation, anti-blooming, multiple exposure, image morphing compensation ~~or~~ and image warping compensation.

51. (Previously Presented) The vision system for a vehicle of claim 50, wherein said at least two image capture devices are positioned on opposite sides of the vehicle, and wherein the synthesized image comprises at least two image portions arranged on said screen in the same orientation as respective locations of said at least two image capture devices on the vehicle, and

Applicants : Kenneth Schofield, Mark L. Larson and Keith J. Vadas
Serial No. : 10/643,602
Page : 3

wherein said image portions are reverse row sequenced from images captured by the respective ones of said at least two image capture devices.

52. (Previously Presented) The vision system for a vehicle of claim 50, wherein at least one of (a) said at least two image capture devices have their fields of view in a direction generally rearward with respect to the vehicle, (b) said at least two image capture devices have their fields of view in a direction generally forward with respect to the vehicle, (c) said vision system comprises a night-vision system, (d) said at least two image capture devices have their fields of view generally symmetrical about the longitudinal axis of the vehicle and (e) said at least two image capture devices are positioned on opposite sides of the vehicle.

53-55. (Canceled).

56. (Previously Presented) The vision system for a vehicle of claim 50, wherein said at least two image capture devices comprise multi-pixel imaging arrays, and wherein said multi-pixel imaging arrays comprise CMOS imaging arrays.

57. (Canceled).

58. (Previously Presented) The vision system for a vehicle of claim 50, wherein said display screen comprises one of (a) a flat panel display comprising one of (i) a liquid crystal display, (ii) a plasma display and (iii) a field emission display, and (b) a cathode ray tube.

59-61. (Canceled).

62. (Previously Presented) The vision system for a vehicle of claim 50, wherein said display screen is at least one of (a) positioned within the field of view of the driver without substantially obstructing the view through a windshield, (b) mounted to one of a dashboard, a fascia, a header and a windshield of the vehicle, (c) mounted at a position conventionally occupied by an interior

Applicants : Kenneth Schofield, Mark L. Larson and Keith J. Vadas
Serial No. : 10/643,602
Page : 4

rearview mirror, (d) a display of one of a projected and a virtual image and (e) a heads-up display.

63-66. (Canceled).

67. (Previously Presented) The vision system for a vehicle of claim 50, wherein at least one of (a) said fields of view of said at least two image capture devices are dynamically adjustable, (b) said fields of view of said at least two image capture devices are dynamically adjustable at least as a function of vehicle speed, and (c) wherein said at least two image capture devices have variable exposure periods.

68-91. (Canceled).

92. (Previously Presented) A vision system for a vehicle, said vision system comprising:

at least three image capture devices mounted to the vehicle and directed rearwardly with respect to the direction of travel of said vehicle;

at least two of said image capture devices being side image capture devices respectively mounted on opposite lateral sides of said vehicle and at least one of said image capture devices being a center image capture device mounted between said side image capture devices;

a display system which displays a composite image synthesized from outputs of said image capture devices, said display system displaying said composite image on a single display screen of the vehicle that is viewable by a driver of the vehicle when the driver is normally operating the vehicle, the displayed image including an image portion from each of said image capture devices; and

wherein said at least three image capture devices are aimed along non-parallel axes and wherein said displayed composite image aids a driver when the driver is reversing the vehicle.

93. (Previously Presented) The vision system in claim 92, wherein one of said two side image capture devices images a side blind spot on the side of the vehicle to which it is mounted and

Applicants : Kenneth Schofield, Mark L. Larson and Keith J. Vadas
Serial No. : 10/643,602
Page : 5

wherein the other of said two side image capture devices images a side blind spot on the side of the vehicle to which it is mounted, and wherein said center image capture device of said three image capture devices mounted to the vehicle images a rear blind spot at the rear of the vehicle.

94. (Previously Presented) The vision system in claim 92, wherein at least one of (a) duplicate or redundant objects are not present in said displayed composite image and (b) said center image capture device has a horizontal field of view that is generally symmetrical about the longitudinal axis of the vehicle.

95. (Previously Presented) The vision system in claim 92, wherein at least one of (a) said center image capture device has a horizontal field of view that is generally symmetrical about the longitudinal axis of the vehicle and wherein said displayed composite image approximates a view from a single location and (b) said displayed composite image approximates a view from a single location.

96. (Previously Presented) The vision system in claim 92, wherein said displayed composite image provides to the driver a sense of perspective in order to enhance the driver's ability to maneuver rearwardly.

97. (Previously Presented) The vision system in claim 92 including an electronically generated graphic overlay seen superimposed on said displayed composite image that enhances the driver's understanding of what is in the area adjacent the vehicle.

98. (Previously Presented) The vision system in claim 92, wherein each of said three image capture devices comprises a CMOS imaging array.

99. (Previously Presented) A vision system for a vehicle, said vision system comprising:
at least three image capture devices mounted to the vehicle, each of said image capture devices having a respective generally rearward field of view, at least two of said image capture

Applicants : Kenneth Schofield, Mark L. Larson and Keith J. Vadas
Serial No. : 10/643,602
Page : 6

devices being side image capture devices respectively mounted on opposite lateral sides of said vehicle and at least one of said image capture devices being a center image capture device mounted between said side image capture devices;

a display system which displays a composite image synthesized from outputs of said image capture devices, said display system displaying said composite image on a single display screen of the vehicle that is viewable by a driver of the vehicle when the driver is normally operating the vehicle, the displayed image including an image portion from each of said image capture devices;

wherein an electronically generated graphic overlay is provided on said displayed composite image that enhances the driver's understanding of what is in the area adjacent the vehicle and wherein said displayed composite image aids a driver when the driver is reversing the vehicle; and

wherein each of said three image capture devices comprises a CMOS imaging array.

100. (Previously Presented) The vision system in claim 99, wherein one of said two side image capture devices images a side blind spot on the side of the vehicle to which it is mounted and wherein the other of said two side image capture devices images a side blind spot on the side of the vehicle to which it is mounted, and wherein said center image capture device of said three image capture devices mounted to the vehicle images a rear blind spot at the rear of the vehicle and wherein said graphic overlay is enabled when the vehicle's gear actuator is selected to be in reverse gear.

101. (Previously Presented) The vision system in claim 100, wherein at least one of (a) said indicia has a form that responds to the rate of turn of the vehicle, (b) said indicia has a form that responds to at least one of the vehicle's steering system, the vehicle's differential system and a compass, (c) the displayed image approximates a rearward-facing view from a single location, (d) said single location is forward of the driver with respect to said direction of travel, (e) the displayed image includes a dead space which would be occupied by said vehicle in said view, (f) the displayed image includes a dead space which would be occupied by said vehicle in said view

Applicants : Kenneth Schofield, Mark L. Larson and Keith J. Vadas
Serial No. : 10/643,602
Page : 7

and wherein said dead space is the size of a footprint of said vehicle in said view, (g) the displayed image includes a dead space which would be occupied by said vehicle in said view and wherein said dead space includes perspective lines which are aligned with said direction of travel, (h) said at least three image capture devices are at substantially the same height on the vehicle and (i) said at least three image capture devices are aimed along non-parallel axes.

102. (Previously Presented) A vision system for a vehicle, said vision system comprising:

at least three image capture devices mounted to the vehicle, each of said image capture devices having a respective generally rearward field of view, at least two of said image capture devices being side image capture devices respectively mounted on opposite lateral sides of said vehicle and at least one of said image capture devices being a center image capture device mounted between said side image capture devices;

a display system which displays a composite image synthesized from outputs of said image capture devices, said display system displaying said composite image on a single display screen of the vehicle that is viewable by a driver of the vehicle when the driver is normally operating the vehicle, the displayed image including an image portion from each of said image capture devices; and

wherein at least one of (a) said at least three image capture devices are at substantially the same height on the vehicle and (b) said at least three image capture devices are aimed along non-parallel axes.

103. (Previously Presented) The vision system in claim 102, wherein the image portion from said center image capture device is compressed, and wherein at least one of (a) said image portion from said center image capture device is vertically compressed, (b) values of adjacent pixels are adjusted as a function of pixel values of removed lines and (c) said image portion from said center image capture device has a vertically central portion and vertically upper and lower portions, wherein said upper and lower portions are laterally wider than said central portion.

Applicants : Kenneth Schofield, Mark L. Larson and Keith J. Vadas
Serial No. : 10/643,602
Page : 8

104. (Previously Presented) The vision system in claim 102, wherein each of said image capture devices comprises a CMOS imaging array.

105. (Currently Amended) A vision system for a vehicle having a gear actuator, said vision system comprising:

at least two image capture devices positioned on the vehicle and directed rearwardly with respect to the direction of travel of said vehicle;

a display system which displays a composite image synthesized from outputs of said image capture devices, said display system displaying said composite image on a single display screen of the vehicle that is viewable by a driver of the vehicle when the driver is normally operating the vehicle, wherein the displayed composite image displayed on said single display screen includes an image portion from each of said at least two image capture devices;

wherein an electronically generated graphic overlay, that enhances the driver's understanding of what is in the area adjacent the vehicle, is seen superimposed on said displayed composite image; and

wherein said graphic overlay is enabled when the vehicle's gear actuator is selected to be in reverse gear.

106. (Previously Presented) The vision system in claim 105, wherein at least one of (a) said indicia has a form that responds to the rate of turn of the vehicle, (b) said indicia has a form that responds to at least one of the vehicle's steering system, the vehicle's differential system and a compass and (b) said graphic overlay has a form that is a function of at least one of the direction or travel and speed of the vehicle.

107. (Previously Presented) The vision system in claim 105, wherein said graphic overlay comprises distance indicia indicating distances behind the vehicle of objects juxtaposed within a grid.

Applicants : Kenneth Schofield, Mark L. Larson and Keith J. Vadas
Serial No. : 10/643,602
Page : 9

108. (Previously Presented) The vision system in claim 107, wherein at least one of (a) said indicia has a form that responds to the rate of turn of the vehicle, (b) said indicia has a form that responds to at least one of the vehicle's steering system, the vehicle's differential system and a compass, (c) the displayed image approximates a rearward-facing view from a single location, (d) said single location is forward of the driver with respect to said direction of travel, (e) the displayed image includes a dead space which would be occupied by said vehicle in said view, (f) the displayed image includes a dead space which would be occupied by said vehicle in said view and wherein said dead space is the size of a footprint of said vehicle in said view, and (g) the displayed image includes a dead space which would be occupied by said vehicle in said view and wherein said dead space includes perspective lines which are aligned with said direction of travel.

109. (Previously Presented) The vision system in claim 105 including an image processor for processing outputs of said at least two image capture devices, wherein said image processor processes said outputs of said image capture devices by at least one technique chosen from luminant blending, chrominant blending, dynamic range extending, pixel group compensation, anti-blooming, multiple exposure, image morphing compensation and image warping compensation.